

Problem 4.24: AM Stereo

A stereophonic signal consists of a "left" signal $l(t)$ and a "right" signal $r(t)$ that conveys sounds coming from an orchestra's left and right sides, respectively. To transmit these two signals simultaneously, the transmitter first forms the sum signal $s_+(t) = l(t) + r(t)$ and the difference signal $s_-(t) = l(t) - r(t)$. Then, the transmitter amplitude-modulates the difference signal with a sinusoid having frequency $2W$, where W is the bandwidth of the left and right signals. The sum signal and the modulated difference signal are added, the sum amplitude-modulated to the radio station's carrier frequency f_c , and transmitted. Assume the spectra of the left and right signals are as shown (Figure 4.32).

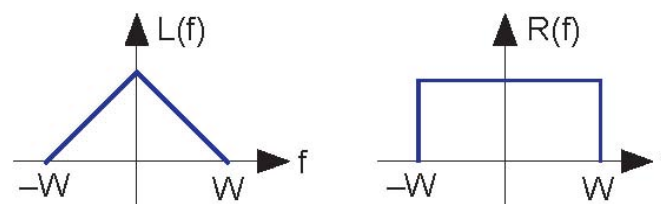


Figure 4.32 AM Stereo

1. What is the expression for the transmitted signal? Sketch its spectrum.
2. Show the block diagram of a stereo AM receiver that can yield the left and right signals as separate outputs.
3. What signal would be produced by a conventional coherent AM receiver that expects to receive a standard AM signal conveying a message signal having bandwidth W ?